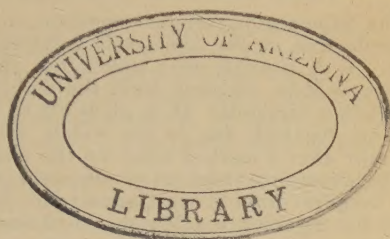


OKLAHOMA
AGRICULTURAL AND MECHANICAL COLLEGE
AGRICULTURAL EXPERIMENT STATION
DEPARTMENT OF POULTRY HUSBANDRY
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Influence of Time of Hatch
on
Hatchability of the Eggs,
Rate of Growth of the Chicks,
and
Characteristics of the Adult Female

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INFLUENCE OF TIME OF HATCH ON HATCHABILITY OF THE EGGS, RATE OF GROWTH OF THE CHICKS, AND CHAR- ACTERISTICS OF THE ADULT FEMALES

The influence of early environment, including the time of hatch, upon the egg production of the females is a fundamental problem of the poultry industry. It is possible that unless the chicks are properly grown optimum results cannot be obtained from the mature stock even with modern feeding and breeding methods. It is plausible to believe that the time of year that chicks are hatched, due to the widely varying weather conditions of Oklahoma, may have a marked effect on the characteristics of the adult females.

The general practice of poultrymen in Oklahoma is to hatch chicks at dates ranging from early January to July; however, the most common months for hatching are March, April and early May. This practice may be considered as fairly reliable evidence in answering the question of what two or three months in the year are likely to be the best for hatching Leghorns for egg production under Oklahoma conditions. Since many poultry keepers practice extremely early hatching and others hatch very late in the season and since September, October, and November hatching is also practiced to a limited extent, it seemed desirable to know if certain months are more suitable than others for hatching Leghorns for egg production.

With the above facts in mind a project was conducted at the Oklahoma Experiment Station in an effort to solve the question of the best time for hatching Leghorns.

PLAN OF THE EXPERIMENT

Twenty-six hatches were made at two weeks intervals as follows:

Lot No.	Date Hatched	Lot No.	Date Hatched
1	Dec. 31, 1923	14	June 30, 1924
2	Jan. 14, 1924	15	July 14, 1924
3	Jan. 28, 1924	16	July 28, 1924
4	Feb. 11, 1924	17	Aug. 11, 1924
5	Feb. 25, 1924	18	Aug. 25, 1924
6	Mar. 10, 1924	19	Sept. 8, 1924
7	Mar. 24, 1924	20	Sept. 22, 1924
8	Apr. 7, 1924	21	Oct. 6, 1924
9	Apr. 21, 1924	22	Oct. 20, 1924
10	May 5, 1924	23	Nov. 3, 1924
11	May 19, 1924	24	Nov. 17, 1924
12	June 2, 1924	25	Dec. 1, 1924
13	June 16, 1924	26	Dec. 15, 1924

All eggs were incubated in a two compartment 500 egg automatic incubator which was located in the incubator cellar at the college poultry farm. Two hundred eggs were incubated for each lot. No eggs were held longer than two weeks before incubating and few were held longer than 10 days. It was planned to raise enough chicks so that fifteen pullets would be avail-

able from each lot to place in the laying pens. The full quota of pullets was not obtained in any of the summer and fall hatched lots except Lot 20 hatched September 22nd.

The eggs used for hatching were produced by hens with an average production of 159 eggs. These hens were of the Oklahoma Experiment station line of breeding and were selected for uniformity of production. They were mated to males that were half brothers and whose dams had laid 200 eggs or more during their pullet year. During the fall of the year, when the hens were molting, it was necessary to set eggs from daughters of the above hens. The pullets were mated to the same males as used with the hens.

All of the chicks, except lots 1, 2 and 3 were brooded under colony hovers heated with natural gas and located in a fifteen by seventy-five foot brooder house on the college poultry farm. Lots 1, 2 and 3 were brooded in an eight by twelve foot colony brooder house heated with natural gas. The pullets were all housed in three sections of a twenty by sixty foot shed roof laying house. All lots were fed and cared for as nearly alike as possible.

The cockerels were removed at from 8 to 14 weeks of age depending somewhat on the development of the particular lot. The pullets were placed in the laying house at twenty-four weeks of age or sooner where early sexual maturity made it necessary.

The chicks were weighed by lots at four week intervals until selections were made for the laying pens. The pullets were weighed individually every four weeks thereafter until they had completed their first year of laying.

The birds were fed the Oklahoma A. and M. College laying ration for the entire year they were in the laying pens. Individual trapnest records were kept, including data on mortality, molt and broodiness. The first dozen eggs laid by each hen and the first six eggs produced by each hen each month were weighed to the nearest half gram.

TABLE II
Record of Hatches

Lots	1-2-3-4 24-25-26	5-6-7-8- 9-10	11-12-13- 14-15-16 17	18-19-20- 21-22-23	All Lots
	Group I, Winter	Group II, Spring	Group III Summer	Fall Group IV,	Total
Dates Hatched	Nov. 17 to Feb. 11	Feb. 25 to May 5	May 10 to Aug. 11	Aug. 25 to Nov. 3	
No. Eggs Set	1,377	1,200	1,400	1,190	5,167
No. Eggs Infertile	178	151	219	256	804
% Fertility	87.1%	87.5%	84.4%	78.5%	84.5%
No. D. Germs 7th Day	88	32	108	119	347
% D. Germs 7th Day	6.4%	2.6%	7.7%	10%	6.9%
No. D. Germs 14th Day	63	48	86	73	270
% D. Germs 14th Day	4.5%	4.0%	6.1%	6.1%	5.2%
No. Dead in shell and weak	248	265	437	333	1,283
% Dead in shell and weak	18.0%	22.0%	31.2%	27.9%	25.0%
No. Hatched	800	703	552	409	2,464
% Hatched of all Set	58.1%	58.5%	39.4%	34.3%	48.2%
% Hatched of Fertile Eggs	66.7%	67.0%	45.4%	43.7%	56.4%

INCUBATION

The lots were arranged in groups according to the seasons hatched and the results of the hatches thus arranged are given in Table II. This table shows the advantage to be with the spring hatched lots. The percent fertility for the various groups shows it to be best during the spring and winter seasons. The percent hatched of all eggs set and the percent hatched of fertile eggs show the spring hatched group to have a slight advantage over the winter group and a decided advantage over the summer and fall hatched lots.

With allowance for unavoidable accidents and disease, chick mortality was appreciably lower during the winter and spring seasons than it was for the chicks hatched during the summer and fall seasons.

GROWTH CURVES AND BODY WEIGHT

The rate of growth shows considerable variation. The lots were grouped by seasons for this consideration. The winter lots were hatched: November 17, December 1, December 15, December 31, January 14, January 28, February 11. The spring lots were hatched: February 25, March 10, March 24, April 7, April 21, and May 5. The summer lots were hatched: May 19, June 2, June 16, June 30, July 14, July 28, and August 11. The fall lots were hatched: August 25, September 8, September 22, October 6, October 20, and November 3. For other considerations the seasonal groups were subdivided into early winter, late winter, early spring, late spring, early summer, late summer, early fall and late fall, making eight sub-groups. There was such small difference in rate of growth in the sub-divisions of each seasonal group that only the seasonal groups were used in making the growth curves.

Figure I presents the average body weight of the birds hatched during the various seasons. The pullets hatched during the winter were heaviest until twenty-five weeks of age. The spring hatched pullets were heaviest from this point until fifty weeks of age at which time the winter hatched pullets again were heaviest and remained so until the end of the laying year. The spring hatched pullets were at all times considerably heavier than those hatched during the summer and fall seasons.

Every group of pullets shows a loss in body weight during the spring and summer months after egg production had begun. The summer and fall groups gained steadily in weight during the laying year after the period of spring-summer decrease in weight was passed. The body weights of all groups show a tendency to converge toward the end of the laying year. The heaviest pullets at beginning of production were hatched during the spring season.

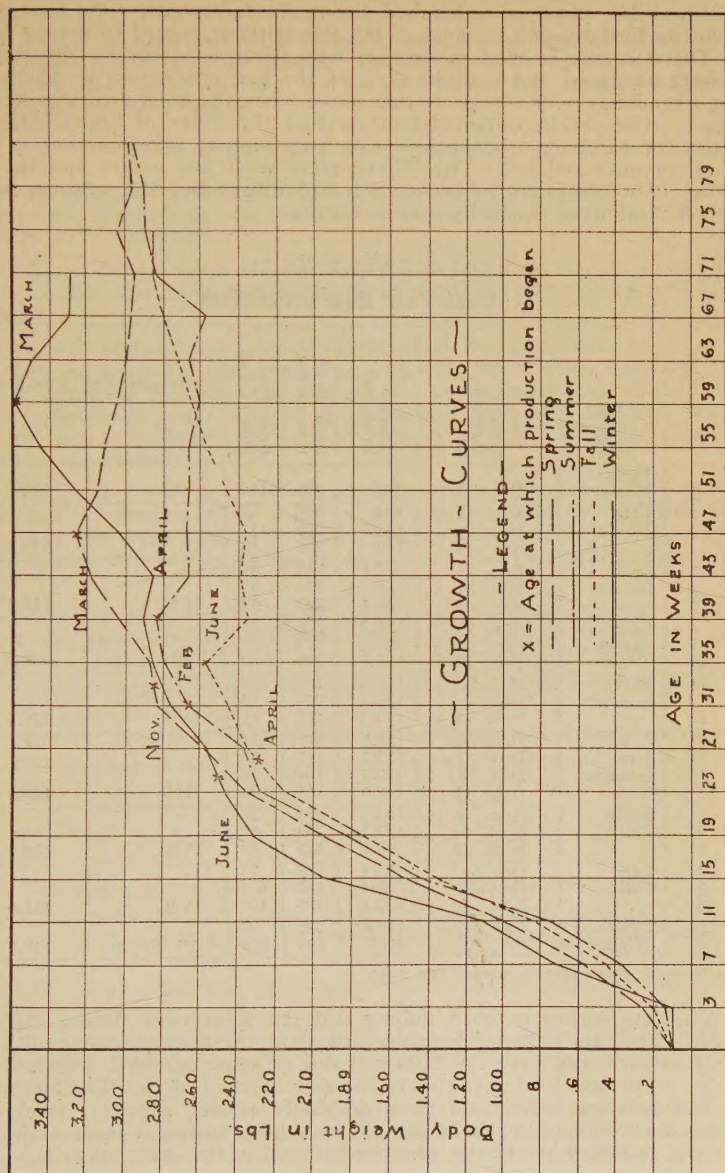
Considerable difference was found in the first production year body weight for the groups hatched at the various seasons. The winter and spring hatched pullets had the greatest average body weight, the early summer hatched pullets ranked next and the late summer and fall hatched birds averaged appreciably lighter in weight than those hatched at other seasons.

EGG WEIGHTS AND EGG PRODUCTION

There was a tendency for seasonal variation in egg weight regardless of when the birds were hatched and the date that production started. All groups showed an upward trend in egg weight from September to February and a downward trend from this point to July or August. When the peak of production was reached during the spring months the size of the eggs decreased.

The date the birds were hatched apparently affected the average first year egg production. A rather steady decrease in average egg production was found extending from the winter hatches to the late fall hatches. At least one fairly high producing hen was present in each lot except Lots No.

FIGURE 1



20, 21 and 22. These were hatched during the fall months. At least one low producing bird appears in most of the lots without regard to season hatched.

The decrease in egg production was fairly constant as the season of hatching advanced and consideration of the egg production by groups indicates a tendency very similar to that noted when the individual lots were considered. The results obtained indicate that the order of desirability of the seasons for hatching, when considering only numerical production, is winter, spring, summer and fall. The difference between the winter and the spring hatches is so slight as to be scarcely significant but the summer and fall hatched birds gave decidedly poorer results.

TABLE XI
First Year Egg Production

Lot Number	Season Hatched	Date Hatched	Average Prod. Lot	High Prod. Hen of Lot	Low Prod. Hen of Lot	Average Egg Production by Groups	
1	Early Winter	Dec. 31	164	199	119	IA	160.0
2	Late Winter	Jan. 14	143	170	88	IB	153.8
3	Winter	Jan. 28	168.7	203	137		
4		Feb. 11	150	225	57		
5	Early Spring	Feb. 25	162.7	218	85	IIA	154.2
6	Spring	Mar. 10	156	234	60		
7		Mar. 24	144.4	225	92		
8	Late Spring	Apr. 7	153.2	222	69	IIB	145.5
9	Spring	Apr. 21	139.6	193	57		
10		May 5	143.1	221	62		
11	Early Summer	May 19	151.4	196	117	IIIA	134.6
12	Summer	June 2	135.4	213	54		
13		June 16	110.2	172	41		
14	Late Summer	June 30	138.4	179	44	IIIB	128.5
15		July 14	122.7	167	86		
16		July 28	129.1	199	82		
17		Aug. 11	126.4	165	84		
18	Early Fall	Aug. 25	105.6	191	28	IVA	109.7
19	Fall	Sept. 8	131.3	173	48		
20		Sept. 22	94.6	125	48		
21	Late Fall	Oct. 6	100.4	135	73	IVB	121.0
22	Fall	Oct. 20	128.4	143	105		
23		Nov. 3	133.1	189	106		
24	Early Winter	Nov. 17	119.6*	150	96	All Groups	138.7
25	Winter	Dec. 1	176*	226	126		

*Few birds in these lots completed the year.

The late spring hatched pullets laid the most eggs during the winter season. The late summer hatched birds laid the fewest winter eggs. The spring hatched lots gave the highest value of eggs per bird, followed rather closely by the late winter and early summer hatched birds. The late summer and fall hatched individuals gave decidedly poorer results. Ranking the seasons according to the value of eggs produced, spring is most desirable for hatching, followed by winter, summer and fall in the order named.

Adult mortality or death rate lowest for the spring hatched birds and highest for those hatched in late summer and late fall. The group just preceding spring (late winter) and the group just following spring (early summer) also showed rather low mortality.

The length of time lost to production due to molt was checked for the pullets hatched at the various seasons. It was found that the later the birds were hatched the longer was the rest period, considering January as the beginning of the hatching season.

GENERAL SUMMARY

1. Beginning December 31, 1923, twenty-six hatches were made at two week intervals throughout one year. Five thousand one hundred and sixty-seven eggs were incubated.

2. Fifteen pullets were selected from each hatch insofar as it was possible, for studies involving time of hatch in relation to the characteristics of the females.

3. Records of incubation, brooding and chick mortality were kept and the chicks were weighed by lots when one day old and at four week intervals thereafter, until the pullets were selected for the laying pens. Pullets were weighed individually every four weeks from this time until the first year of production was completed. A total of more than 3,500 weighings of adult individuals was made.

4. All females were trapnested and data were collected on adult mortality, molt and broodiness. The first twelve eggs produced by each individual and the first six eggs laid each month, by each individual, were weighed. Between fifteen and twenty thousand eggs were weighed individually in this study.

5. All birds were fed the same rations (growing and laying) all were grown in the same brooder house and yards and were housed in the same laying house. The same care, as near as possible, was given to all lots.

6. Fertility was highest in the eggs hatched on dates ranging from December 31 to April 7 inclusive.

7. Fertility decreased considerably during the summer and fall seasons.

8. The number of dead germs on the seventh day was noticeably greater for the period beginning July and continuing through the summer and fall seasons.

9. The best hatches were secured between December 31 and April 7 inclusive.

10. The summer and fall hatches gave markedly poorer results.

11. The chick mortality was greater for the summer and fall hatches than for the winter and spring hatches. The late winter hatches gave the lowest percent chick mortality.

12. The winter hatched birds grew more rapidly than did the spring, summer or fall hatched chicks.

13. The spring hatched individuals maintained a faster rate of growth, and were heavier throughout the first laying year than were the summer or fall hatched pullets.

14. The "summer weather handicap" was especially noticeable in the growth of summer hatched chicks. The growth of the fall hatched chicks was checked due to winter weather before they attained maturity.

15. The spring hatched individuals were heavier at beginning of production and were also older when laying began, than were the birds hatched at other seasons.

16. In general, the later the pullets were hatched the lighter they averaged in first year (of production) body weight, considering the winter hatched groups as the starting point.

17. The birds that were hatched during the winter, summer, and fall months matured sexually at an earlier age than did those hatched during the spring season.

18. The tendency for birds to begin laying during the natural breeding season is believed to be responsible, at least in part, for the variation in age at sexual maturity.

19. The spring hatched birds produced the heaviest "first dozen" eggs.

20. All groups showed an increase in average egg weight for the first two or three months of production.

21. A tendency was noted for seasonal variation in egg weight regardless of when the birds were hatched and the date that production started. All groups showed an upward trend in egg weight from September to February and a downward trend from this point to July or August.

22. The spring hatched pullets produced the heaviest eggs, on the average, with the winter and summer hatched birds next in order named and the eggs produced by the fall hatched birds averaged lightest in weight.

23. There was little difference in the average egg production between the winter and spring hatches. The summer and fall hatched birds gave decidedly lower production.

24. The highest winter egg production was obtained from the late spring hatched birds (hatched April 7 to May 5).

25. When the seasons were ranked according to the value of eggs produced by the birds hatched during each, spring is the most desirable, followed by winter, summer and fall in the order named.

26. The adult mortality was much lower for the spring hatched pullets than for those hatched at other seasons. The late summer and fall hatched birds suffered the highest adult mortality.

27. The (molt) or rest period was somewhat longer for the summer and fall individuals than for the winter and spring hatched birds.

28. The optimum time for hatching Leghorns in Oklahoma to obtain heavy body weight at beginning of production proved to be during the spring season.

29. The intimate relationship found to exist between first year egg production and length of the molt (or rest) period suggested that the bird that molted slowly was the poor producer.

30. Early sexual maturity was associated with high egg production.

31. No correlation was found to exist between the number of eggs laid and the size of the eggs produced the first year.

32. The birds that laid the larger first dozen eggs tended to produce larger eggs throughout the year.

33. The birds that were heavier at sexual maturity were heavier throughout the first production year.

34. No association was found between age at sexual maturity and average first year body weight. Evidently the early maturity birds, though lighter in weight when beginning to lay, were able to overcome this disadvantage during the laying year.